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CORNING

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RESEARCH AND DEVELOPMENT LABORATORY

TECHNICAL STAFFS DIVISION

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ABSTRACT:

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CORNING GLASS WORKS
ELECTRO-OPTICS DEPARTMENT
RALEIGH, NORTH CAROLINA

IMPROVED SCREEN FOR REAR-PROJECTION VIEWERS

Technical Reports Nos. - 41, 42, and 43

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TECHNICAL REPORTS NOS. 41, 42, and 43

1. Scattering Screens

Square-wave modulation transfer function (MTF) measurements have been completed on the $12\frac{1}{8}$" x $15\frac{1}{8}$" screens described in Technical Report No. 40. These measurements were made with a square-wave mask in contact with the scattering layer on the illumination side of the screen. The illuminated portion of the screen was projected onto a viewing plane containing a narrow slit oriented parallel to the alternating clear and dark bars of the square-wave mask. The mask contained sets of bars at various spatial frequencies. Mask and screen were clamped together and translated slowly across the projection lens focal plane, producing maximum and minimum output voltages from a detector placed behind the slit. The MTF of the optical system, including the 1/4" glass substrate of the screen, was independently measured and taken into account. Furthermore, the illuminated area of the screen was kept small enough to preclude degradation of contrast by trapped light. The quantity we have measured is thus a characteristic of the scattering layer only, independent of the substrate thickness or transmittance. The spectral region for the measurement was 480 — 580 mμ. The results are tabulated below and plotted in Figs. 1 and 2 for spatial frequencies of 0, 5, 10, and 15 mm^{-1}.

SCREEN	SQUARE-WAVE MTF OF SCATTERING LAYER			
	0 mm^{-1}	5 mm^{-1}	10 mm^{-1}	15 mm^{-1}
AQ-11	1.0	0.974	0.908	0.788
AQ-17	1.0	0.976	0.888	0.700
AQ-18	1.0	0.970	0.867	0.716
AQ-20	1.0	0.961	0.819	0.653
AR-27	1.0	0.985	0.920	0.820
AR-28	1.0	0.971	0.943	0.844
AL-4	1.0	0.975	0.934	
AL-5	1.0	0.985	0.895	

Figure 3 shows the dependence of the MTF on the axial gain of the scattering layer. This dependence arises from the finite thickness of the layer. The lower the axial gain, the more spreading takes place as an incident beam of light passes through the scattering layer, and the lower the MTF.

2. Lenticular Screens

Work is proceeding on the crossed cylindrical lenticular screens. We have been notified by the vendor that tooling has been completed for the pressing of the lenticular sheets in epoxy-on-Mylar plastic. These materials were chosen for their good thermal and chemical properties with respect to the processes to be used in masking of the screens. Sputtering and vacuum deposition of various materials onto Mylar sheet have been tried in an attempt to obtain highly opaque but low-reflectance films for masking.

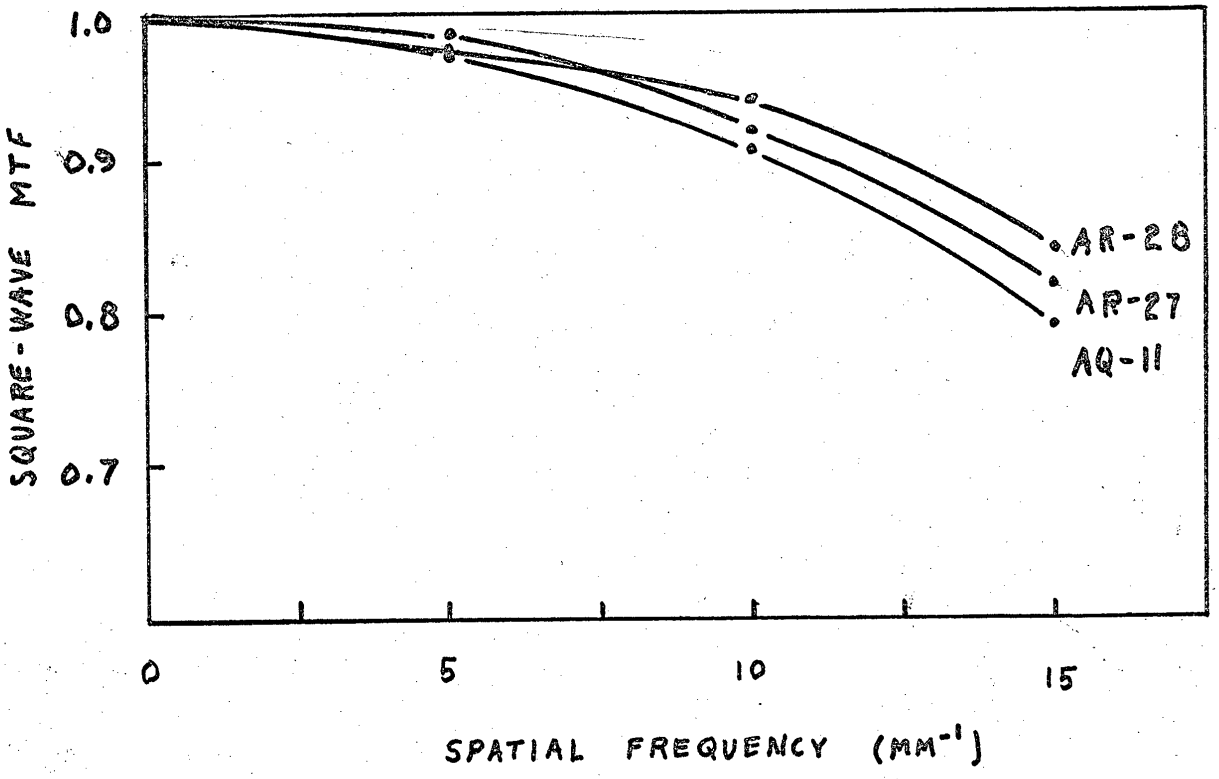

Figure 1. Square-wave MTF curves for the scattering layers of screens AQ-11, AR-27, and AR-28.

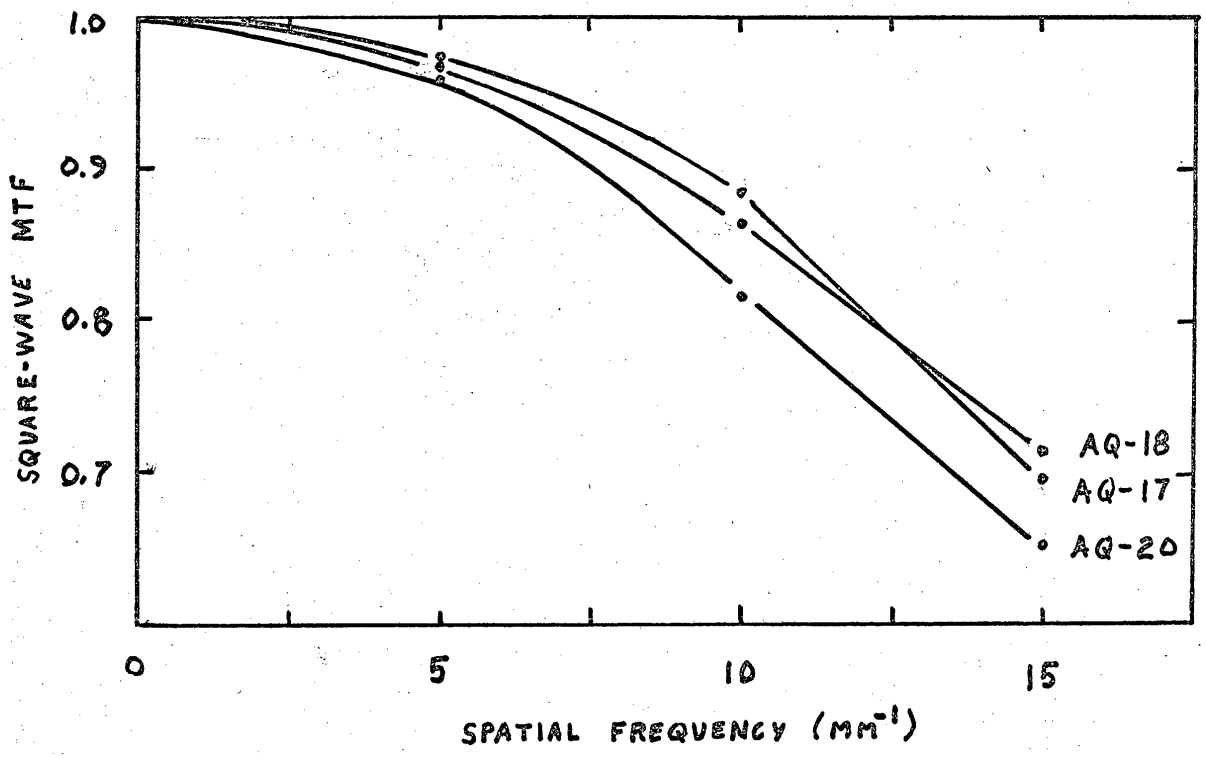

Figure 2. Square-wave MTF curves for the scattering layers of screens AQ-18, AQ-17, and AQ-20.

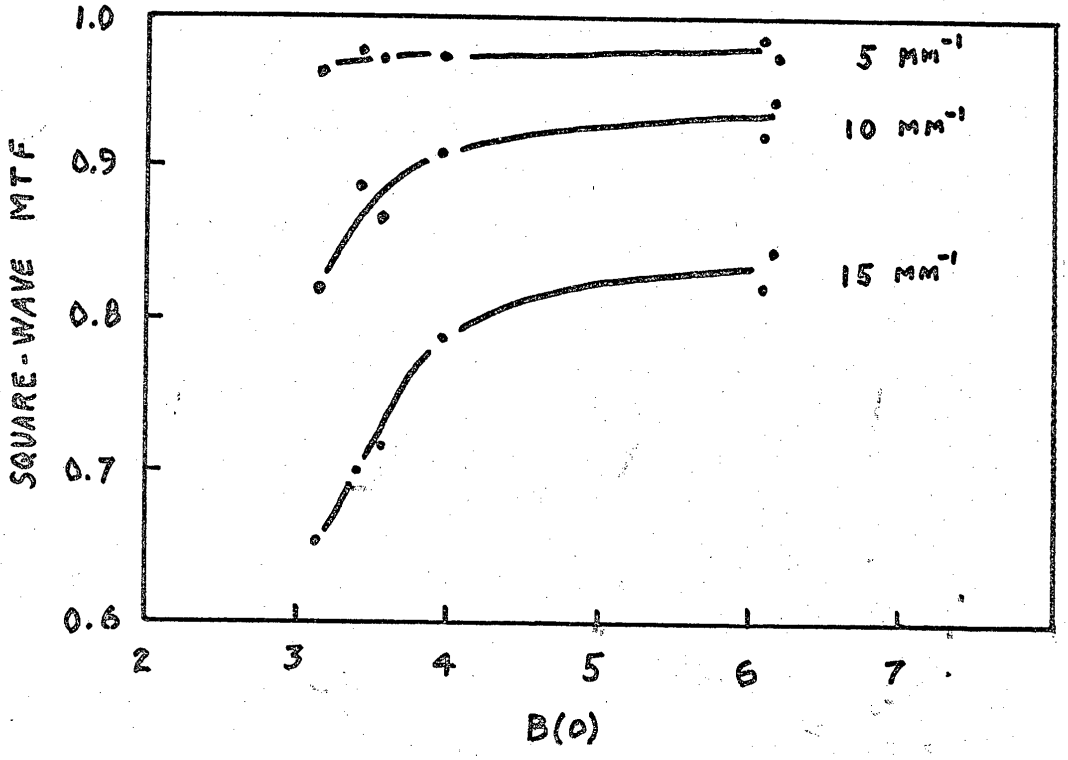

Figure 3. Square-wave MTF versus axial gain B(0) for spatial frequencies of 5, 10, and 15 mm^{-1}.